USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2005WY23B

Title: Land Use Impacts on Nitrogen Fixation in Jackson Hole Streams

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Principal Investigator:
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Abstract

Pollution from excess nitrogen (N) threatens many freshwater and marine ecosystems with eutrophication. Rivers and streams play a central role in N cycling at the landscape scale because rivers provide an avenue to transport N from the terrestrial landscape to downstream ecosystems. Rivers are more than conduits and may play a strong role in transforming or storing N. Changing land use in the Western US may alter how streams transform and process N. Currently we are studying how contrasting land use may affect N cycling in streams in Jackson Hole, WY. We are examining how land use alters the removal and fate of nitrate-nitrogen using experimental addition of 15N tracers. Missing from our studies is an understanding of how N fixation alters stream N budgets and cycling, and how land use may affect N fixation. In these streams, N-fixation (i.e., the creation of biologically available N from atmospheric N2) may be a dominant pathway for N input . We hypothesize that unimpacted streams will have high rates of N-fixation that drives the stream N budget, while hydrologically impacted streams (e.g., irrigation ditches) and streams with elevated nitrate concentrations will have lower N fixation rates. We will measure N fixation in the context of summer stream N budgets in 9 streams in and around Jackson Hole that we are using as part of our larger study. The 3 land use types are reference (unimpacted; streams in Grand Teton National Park), irrigated cattle pasture (streams on the Snake River Ranch), and suburban (Jackson Hole Golf Club and

2 streams in condominium developments). We will measure N fixation rates in each of these 9 streams using the acetylene reduction method calibrated with isotope measures. In 4 streams, we will estimate the importance of N fixation in the context of a stream reach nitrogen budget that considers inputs and outputs of N combined with rates of internal processing.